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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/587,130

12/28/2007

Bernd Rech

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535 7590 01/15/2010
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EXAMINER

BERMAN, JASON

ART UNIT

PAPER NUMBER

1795

NOTIFICATION DATE

DELIVERY MODE

01/15/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/587,130	Applicant(s) RECH ET AL.	
	Examiner Jason M. Berman	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 8-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 17-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11/13/09 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>12/8/09 and 7/21/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of the Claims

Claims 1-19 are pending in the current application. Claims 8-16 are withdrawn as being directed towards a non-elected invention.

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 1-7 and 17-19, in the reply filed on 11/13/09 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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4. Claims 1-2, 4-5, 7 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kariya (US 6,107,116) in view of Xiong (US 6,537,428).

As to claim 1, Kariya discloses a method for producing a conductive and transparent zinc oxide layer on a substrate by reactive sputtering comprising:

- Using a doped metallic Zn target with a doping content of less than 2.3 at% (col 8 lines 24-60: Zn target with fluorine doping; col 5 lines 2-3: 0.1 - 10 at% doping content);
- Heating the substrate to a substrate temperature of greater than 200°C (col 8 lines 24-60: substrate temperature 200-600°C); and
- Setting a static deposition rate of more than 190 nm/min (col 13 line 39: deposition rate up to 10nm/sec (600 nm/min)).

Kariya, while disclosing the reactive deposition of ZnO, is silent as to the selection of a stabilized operating point within the unstable process region.

Xiong discloses a method of reactive sputtering of a Zn target in an O₂ atmosphere in which the reactive gas flow is controlled to maintain the deposition in the transition region between metal and poisoning mode (abstract; claims 4 and 5: Zinc with oxygen reactive sputtering; figure 2: showing control of oxygen flow rate to maintain deposition in transition mode). This operating point provides a high rate of deposition of high quality films (abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to select an operating point in the unstable transition region, as

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disclosed by Xiong, in the method of Kariya, because this allows for a high deposition rate and formation of a high quality film.

It should be noted that Koriya does not explicitly state the dynamic deposition rate for the sputtering process. Koriya does disclose the static deposition rate and the movement of the substrate (col 13 line 39: deposition rate up to 10nm/sec (600 nm/min); figure 4) and the formation of a ZnO layer of 1-50 nm (col 12 line 34).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a dynamic deposition rate of greater than 50 nm*m/min in order to successfully form this layer at the required thickness with the stated deposition rate.

As to claim 2, Kariya discloses the doping content is less than 1.5 at% (col 5 lines 2-3: 0.1 -10 at% doping content)

As to claim 4, Kariya discloses the substrate is heated to temperatures above 250° C (col 8 lines 24-60: substrate temperature 200-600°C).

As to claim 5, Kariya discloses a static deposition rate of more than 300 nm/min (col 13 line 39: deposition rate up to 10nm/sec (600 nm/min)).

It should be noted that Koriya does not explicitly state the dynamic deposition rate for the sputtering process. Koriya does disclose the static deposition rate and the movement of the substrate (col 13 line 39: deposition rate up to 10nm/sec (600 nm/min); figure 4) and the formation of a ZnO layer of 1-50 nm (col 12 line 34).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a dynamic deposition rate of greater than 50 nm*m/min in order to successfully form this layer at the required thickness with the stated deposition rate.

As to claim 7, Kariya discloses a dynamic flow process where the substrate is moved during sputtering (figure 4: showing movement path of substrate through various processing chambers).

As to claim 17, Kariya discloses the doping content is less than 1 at% (col 5 lines 2-3: 0.1 -10 at% doping content)

As to claim 18, Kariya discloses the substrate is heated to temperatures above 300° C (col 8 lines 24-60: substrate temperature 200-600°C).

As to claim 19, Kariya discloses a static deposition rate of more than 380 nm/min (col 13 line 39: deposition rate up to 10nm/sec (600 nm/min)).

It should be noted that Koriya does not explicitly state the dynamic deposition rate for the sputtering process. Koriya does disclose the static deposition rate and the movement of the substrate (col 13 line 39: deposition rate up to 10nm/sec (600 nm/min); figure 4) and the formation of a ZnO layer of 1-50 nm (col 12 line 34).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a dynamic deposition rate of greater than 50 nm*m/min in order to successfully form this layer at the required thickness with the stated deposition rate.

5. Claims 3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kariya in view of Xiong, as applied to claim 1 above, and further in view of Kon ('Impedance Control of Reactive Sputtering Process in Mid-Frequency Mode with Dual Cathodes to Deposit Al-Doped ZnO Films' as cited in IDS).

As to claim 3, Kariya discloses a doped Zn target, but is silent as to the use of Al as the doping material.

Kon discloses a method of forming a transparent and conductive zinc oxide layer using a doped Zn target by reactive sputtering in a transition mode (page 263: introduction). Kon also discloses that aluminum doped ZnO films (AZO) are superior for use in optoelectronic devices because of their reduced resistivity (page 263: introduction).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an Al doped target, as disclosed by Kon, in the method of Kariya, because this forms an effective optoelectronic layer.

As to claim 6, Kariya discloses use of RF magnetron sputtering (col 9 line 19), but is silent as to a dual magnetron arrangement with medium frequency excitation.

Kon discloses a method of forming a transparent and conductive zinc oxide layer using a doped Zn target by reactive sputtering in a transition mode (page 263: introduction). Kon also discloses the use of dual magnetrons with mid-frequency excitation (title; page 264: experimental data).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use dual magnetrons with mid-frequency, as disclosed by Kon, in the method of Kariya, because this allows for a greater deposition rate and effective formation of an optoelectronic layer.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Berman whose telephone number is (571)270-5265. The examiner can normally be reached on M-R 8am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571)272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

/J. M. B./
Examiner, Art Unit 1795
1/13/2010